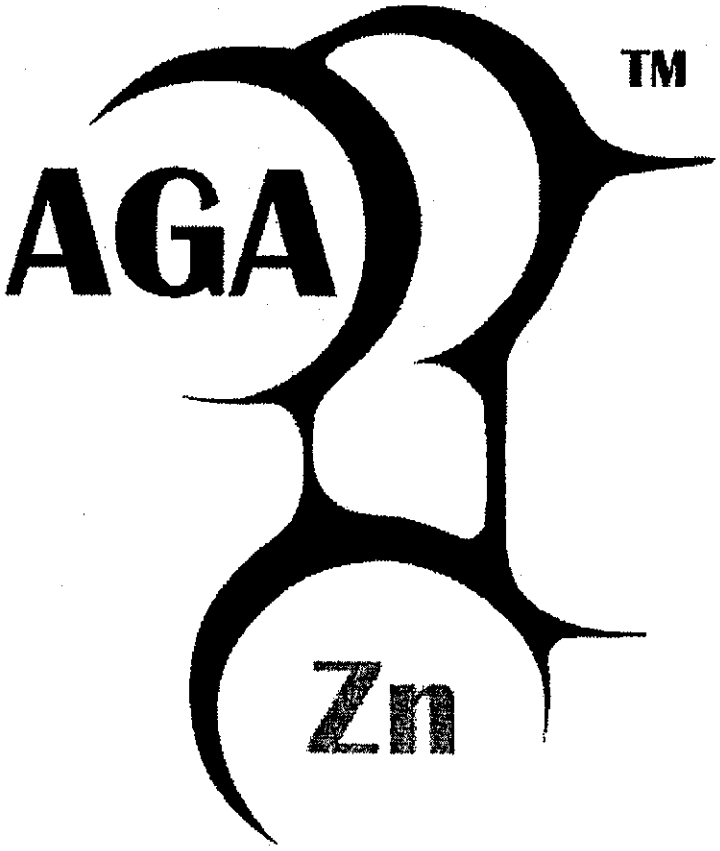
An Anecdotal History of the Galvanizing Industry



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By Charlotte Evans

In the spring of 1920, as industries around the world were coming to grips with the realities of business after the First World War, the two-year-old American Zinc Institute met in Chicago. One of the featured speakers was a newspaperman named Coldren who had been invited to talk about the problem of getting publicity for the zinc industry.

A major factor, Coldren said, was the nature of the product itself. "Zinc is not nearly as widely known as it should be," he said. It isn't a metal that gets into print easily, because there isn't any particular romance wrapped up in it. By nature it is a dull and prosaic metal. Its very color is against it. Gold glitters, silver shines, diamonds sparkle, and rubies glow, but what does zinc do?

"Nobody ever argues there is a pot of zinc at the foot of the rainbow," he continued. "No one ever said the streets of heaven are paved with zinc. No thief ever broke into a man's house, or blew up a safe, or held up an express train to get zinc. No beautiful heroine was ever tempted by a villain with zinc jewelry. Judas probably wouldn't have betrayed Jesus for 30 pieces of zinc."

Coldren may have been right about heroines and Judas. But it's too bad he never got to interview some Iranian army recruits who were the subject of a study in recent years because they were extraordinarily small for their age and had not reached puberty. The research showed the recruits were suffering from a zinc deficiency, according to Frank Porter in "The Zinc Handbook." When they were given zinc supplements, they grew six inches in six months and achieved puberty.

Indeed, sex appeal may have had something to do with the development of the process we know as galvanizing – the coating of iron or steel with molten zinc to prevent rust – which is 250 years old this year.

According to Katherine B. Shippen in her book "The Bright Design," the man for whom the process is named, Luigi Galvani, was appointed to the faculty of the University of Bologna in the 1770s. He first studied to be a monk, then took a degree in law, but finally decided to specialize in anatomy. Shippen suggests he might have been influenced by his friend Beccaria, who was on the Bologna faculty and whose daughter Lucie later became Galvani's wife.

But before we get carried away with sex appeal, let's take a look at some outstanding examples of galvanizing at work:

- When the W.H. Maze Company of Peru, Ind., was established in 1848, it had nothing to do with nails. It was a lumberyard that found it couldn't buy quality nails, according to Peter G. Loveland, the current president. "In the 1890s," he said, "the company decided to make its own nails using pure zinc, but there was a catch for customers: in order to buy Maze nails they had to buy Maze shingles. This didn't go over well with other shingle suppliers," Loveland said. Maze agreed to sell nails separately and greatly increased the number it manufactured. Today the company double-dips its trademarked Stormguard Nails and processes them for uniformity between dips. The lumberyard is still in business.

- The Brooklyn Bridge, which opened in 1883, was the first suspension bridge to use galvanized wire, a practice that became standard. Before that, bridge cable wire was protected by oil, grease, or paint. An estimated 14,568 mile of galvanized steel wire was used for its four main cables, most of which was in fine shape 100 years later when the bridge underwent a $112 million rehabilitation. "The galvanized wire used to fabricate the cables

made a major difference in preserving the structure," said Arthur Tang, project manager. "There's no question about that. No other material that I know of could do the job better."

- When the Witt Cornice Tin/Slate Roofing Company was founded in Cincinnati by George C. Witt in 1887, it had nothing to do with garbage cans. But in 1899, Witt, was dismayed by the "piles of unwrapped garbage strewn in the streets by dogs, cats, rats, and wind. According to a company history, they received a patent for a corrugated ash can. The cans were coated with zinc, averaging 4.78 ounces per square foot. "Ordinary cans," according to a 1924 promotion, "have a coating of approximately 2.25 ounces to the square foot." In February 1938, the DuPont Magazine reported on the transition of the Witt Company from a maker of roofing, cornices and a general line of sheet metal work to a maker of galvanized ash and garbage cans.

- In 1965, Rolls Royce introduce the Silver Shadow, the first major design change in more than 50 years. It had a unitary construction, integrating the chassis with the body shell, and a lighter-gauge steel was used. All parts and structural reinforcements of the underframe assembly were galvanized to ensure that gauge thickness – hence strength – was maintained and to protect the lowered chassis from de-icing salts, flying stones and road grit.

- About one million chevron panels cover the roof of the Sydney Opera House, completed in 1973. To protect the panels, yet keep their weight as low as possible, a galvanized wire mesh was installed on the Australian landmark.

- In the 1980s, engineers for the National Aeronautics and Space Administration sought to reduce the force exerted against the space shuttle orbiter caused by the rapid ignition of the solid rocket booster – from zero to 2.25 million pounds in eight-tenths of a second at liftoff. They adapted a sound suppression system that involved spraying water under the mobile launch pad just before and during shuttle ignition. The system consisted of steel pipes hot dipped in zinc.

This vital substance is silvery blue-gray in color and has a relatively low melting point (419.4 Degrees C) and a relatively low boiling point (907 degrees C). It comprises an estimated 0.004% of the earth's crust and ranks 25th in order of abundance. It is essential for the growth and development of almost all life: Between 1.4 and 2.3 grams of zinc are to be found in the average adult, and the World Health Organization has recommended a daily intake of 15 milligrams.

Used in galvanizing, zinc seals the underlying steel from contact with its environment. If the steel is exposed to the elements due to mechanical damage, the zinc corrodes sacrificially, leaving its host intact.

Corrosion is caused by the inherent tendency of metals, when subjected to air and moisture, to revert to their original earthly forms. They do this through chemical or electrochemical reaction with their environment. As "The Story of Yesterday and Today," a book quoted by the Bulletin of the American Zinc Institute in 1923, put it: "Rust is nature's way of taking back the metals that man has wrested from the bosom of Mother Earth. What comfort can one have in guiding an edifice, a mechanism, a piece of art from corrodable metal when falling upon his labors is the shadow of the great destroyer, rust?" it asked. "To build in the metals that are subject to rust is to invite desecration of objects that should stand as lasting

testaments to the idealism that conceived them, the genius that executed them and the frugality that founded them."

Why should anyone but chemical engineers care about this? Very simply, because corrosion costs money, and lots of it. The Columbus Battelle Institute estimates that corrosion costs Americans more than $220 billion annually, about 4.3% of the Gross National Product. This is roughly enough to construct 550 New York City World Trade Centers or operate the state of Iowa for 281 years.

Even on its 250th anniversary, galvanizing is a relatively new use of zinc. H.D. Carus wrote a chapter in "ZINC – the Science and Technology of the Metal, its Alloys and Compounds," written by C.H. Mathewson who cites an ancient Greek description of it as "false silver." The oldest known piece of zinc extant, he wrote, is in the form of an idol found in the prehistoric Dacian settlement at Dordosch, Transylvania., and two bracelets filled with zinc have been found in the ruins of Cameros, destroyed in 500 B.C. The front of a fountain, partly covered with zinc, was found in the ruins of Pompeii, destroyed in 79 A.D.

"The Chinese reportedly used zinc for coins and mirrors in the 7th century A.D., and the metal seems to have been known in India as early as 1000 to 1300 A.D." Carus says.

About 1730, the knowledge of smelting zinc reached England from China. William Champion of Bristol was the first Englishman to produce this metal on a large scale, beginning in 1740.

The first zinc produced in the United States came form the Arsenal in Washington, D.C., in 1835, according to Carus. The government, seeking to establish definite standards of weights and measures, imported Belgian workers and built a small spelter furnace to make zinc needed to form the brass for each standard.

It was not Luigi Galvani who discovered the process we call galvanizing. The first known scientific description of the as-yet-unnamed technique was made by a French chemist, "P.J. Malouin," before the Royal Academy of Sciences on August 22, 1742, and it is on that basis that galvanizing's 250th anniversary is being marked this year.

Malouin took some 20 pages to summarize his experiments, noting: "I hope that this research may have some utility and procure some new knowledge on the nature of zinc and tin." He went on to describe a peculiar sound – a cry or screech – that tin made when it was bent and said he wanted to see whether zinc had the same quality.

"It is not as easy as one imagines," he said. "First, the zinc is very hard. It is imported from Germany and China in very heavy bars, too thick to bend in any way. In order to have it thin and be able to bend it, I melted a piece and poured it onto a tile that was in an incline position..... The scum of the zinc stays on the top of the tile, and the metal part, the most pure, runs to the bottom of the tile... When the zinc cooled down, I folded it on the thinnest edge and I was pleasantly surprised to find the same screech as the tin. I think that the screech was even stronger in the zinc that in the tin."

In Malouin's time, there were many references to zinc-coated iron saucepans, according to R. Lewis Stubbs's history of galvanizing written for the Fifth International Conference on Hot-Dip Galvanizing in 1958. A Welsh bishop, Richard Watson of Llandaff, described a method in use at Rouen for applying a zinc coating by dipping. "The vessels are first made very bright of

salammoniac and afterwards dipped into an iron pot full of melted zinc." He also referred to dipping vessels a second time to obtain a thicker coating.

It was some 30 years after Malouin's presentation that Galvani stumbled upon his theory of animal electricity, which was to serve as a building block in the development of galvanizing. Shippen says, according to legend, Lucie Galvani was ill and a physician had prescribed a broth of frogs' legs. Somehow the frogs' legs found their way to the metal table where Professor Galvani was working. An assistant touched them with a scalpel, and to his surprise, the legs began to twitch. In response, Shippen says, "Galvani took several pairs of frogs' legs and hung them from hooks to the railing of his balcony. Whenever the wind blew so that the legs touched the railing, they quivered and twitched, leading him to conclude that animal electricity was the cause."

The theory proved highly controversial, and over time Galvani's colleagues deserted him. (Eventually his teaching career ended when he refused to swear allegiance to Napoleon.)

Galvani had been right in saying that there is such a thing as animal electricity, but what made the frog's legs move was current electricity – and proof would be provided by Alessandro Volta (as in "volt"), a professor of physics at the University of Pavia.

Volta contended that electricity had been created by contact between two dissimilar metals, assisted by the moisture in the frog's legs. To verify that contention Volta stacked disks of copper and zinc together after moistening their surfaces with vinegared blotting paper. The pile produced electricity by dissolving zinc, and Volta's efforts were rewarded in 1801 when Napoleon summoned him to Paris to exhibit his disks before the Institute of France.

Zinc was first employed for roofing around 1811, when the Abbe Daniel Dony, founder of the Belgium zinc industry, roofed a house with sheet zinc in an effort to establish a market for his small output of spelter, according to 1904 history of zinc roofing by the Lanyon Zinc Company of St. Louis. In the same year portions of the roof of the Church of St. Barthelemy, at Liege, were covered with the metal.

Still, the industry "was only a trifling and struggling affair," as W.R. Ingallis, editor of the Engineering and Mining Journal, described it to the first meeting of the American Zinc Institute in 1918. "There was no broad market for the metal," he said. "It was not until Dominiuqe Mosselman [Dony's successor] entered the business in 1818 and devoted himself to establishing a market for zinc by educating the people in its uses that the industry could be said to have its commercial birth."

A key connection was made by Michael Faraday, an assistant to Sir Humphrey Davy, the eminent British chemist and physicist. Faraday discerned the sacrificial action of zinc in protecting iron when the two are in contact in the presence of saline solution and air. He recorded his observation in his diary of November 26, 1829, in somewhat choppy English: "Clean iron nails laid on clean sheet zinc in dishes with fluid so that both iron and zinc partly in fluid, partly in air. For the purpose of observing the protecting power of zinc over iron.

"After many days examined. Where water the fluid, action and oxidation both of iron and zinc – no protection of iron – no serious corrosion of zinc by its contact. Apparently not more than where wood intervening, but where sol. of common salt used there iron fully protected; no corrosion of it, great corrosion of zinc – when wood intervening then both corroded. Hence

zinc can protect iron and iron destroy zinc in chemical action, etc. in exciting electricity. The iron nail on the zinc in solution of salt had much free alkali adhering to it."

It was seven years later, in Paris, that galvanizing to its name. On May 10, 1837, Stanilaus Tranquille Modeste Sorel, a civil engineer, took out a patent for a process of coating iron by dipping it in molten zinc. He named the process "galvanizing" – perhaps being to modest or too tranquil to call it "sorelizing."

In the preamble to his patent application, Sorel was generous in giving credit to his predecessors: "Following the important discovery by Galvani and Volta that electricity is generated through the contact of dissimilar metals," he wrote." he wrote, "it was noticed in Volta's battery that one of the two metals was always preserved from oxidation..... The first person who noticed this behavior was Davy, who proposed application of the principle for the preservation of iron; it has been tried in England for preserving the copper bottoms of sailing boats... The method that I propose is also based on the behavior of dissimilar metal in contact but the system is quite different.... This method consists of completely coating the surface of iron with a layer of zinc. First the iron is well cleaned and after being immersed in hydrochloric acid or a solution of salammoniac, it is plunged into a bath of molten zinc. Iron prepared in the manner just described is preserved from rust."

Over the next five years Sorel worked to perfect the process producing 23 additions to his patent. "Every day of practice in a new industry gives birth to new improvements," he wrote. "This is what has happened with our discovery; the parent idea is a trifle, the details are everything – they form a new industry."

By this time, according to Porter, industry was making great progress thanks to two driving forces. The first was an economic liberalism "...following 50 years of change and conflict between the ideas of free trade and a controlled economy." More than 500 public companies were founded in 1836 and 1837, as many as in the previous decade. The second was technological, characterized above all by the harnessing of energy that would develop the steam engine and transform ironworking. "Steam, coal, and iron comprise the dominant trinity of the 19th century with coal providing the basic energy for the other two," Porter writes.

Because the development of galvanizing had drawn on the earlier process of tinplate production, it was only logical that galvanizing should have taken hold early in England and France, which had led in producing tinplate. The same year Sorel received a French patent in 1837, Commander H.V. Craufurd of the Royal Navy was awarded an English patent for a process of dipping into molten zinc, using ammonium chloride as a flux, or cleaning agent. "It cannot be doubted," says Porter, "that this derived from Sorel."

The name given to the new zinc coating quickly found favor since zinc was the metal almost universally used for producing galvanic electricity, according to Porter, and in 1838 the English, Scotch, and Irish Galvanized Metal Company was organized in London. The following year the patent rights were transferred (at a royalty of £ 3 per ton) to the British Galvanization of Metals Company. Further changes are recorded. Porter notes, "including the inevitable litigation."

By 1850, British galvanizers were using 10,000 ton of zinc annually and their products were prominent at the first great World Exhibition held in the Crystal Palace in London the following year, according to Stubbs.

Corrugated iron, which had been developed in 1844, was soon galvanized in considerable quantities and supplied for roofing as an alternative to sheet zinc. "In addition," Stubbs says, "a large export trade developed in galvanized sheet as gold rushes in California and Australia stimulated the demand for portable buildings and pans for washing gold. The first telegraph company was registered in Britain in 1850 and used bundles or coils of galvanized wire. Galvanizing was also used for submarine telegraphy, and one British firm installed a galvanizing plant in 1856 to make some 10 tons of wire a week for the first Atlantic telegraph cable. In 1860," Stubbs continued, "a machine was invented for continuously annealing and galvanizing wire, thus making it the first specialized branch of the industry; shortly thereafter, barbed wire came into use for fencing in Australia, South America, and the United States." Until the 1870s, it was mostly cast and wrought iron that were galvanized, since steel was expensive. The inventions of Bessemer and Siemens however, led to cheaper steel and a period of rapid industrial expansion. Steel production worldwide rose from half a million tons in 1870 to 28 million tons a year by the end of the century. At about the same time, hygiene became increasingly popular, promoted by tubs and showers made of zinc or galvanized sheet. Not everybody was taken with the notion, however. The principal of an Oxford college expressed surprise at the emphasis on bathing; undergraduates, he said, were in residence for only eight weeks at a time.

Leadership in galvanizing, as in other industries, passed to the United States, and a charming personal account of the American scene is provided by Gale McComb in the foreward to a book called "Hot-Dip Galvanizing Practice:"

"About 70 years ago [c. 1870] three men met at a luncheon in a John Street chop house, New York. All three had interests in pipe mills. None of these mills had facilities for galvanizing and the demand for galvanized pipe was increasing.

"So these three men put $30,000 in a pot, bought eight lots in Jersey City, N.J., and established the Jersey City Galvanizing Company. The product from these pipe mills was sent to the Jersey City company to be galvanized. Most of the time the vacant lots about the galvanizing plant were piled shoulder high with pipe to be galvanized. The three founders paid themselves back the $30,000, 18 times over in the first five years.

"One of these three pioneers was my great-grandfather, John Jesse Spowers. After his death years ago the Jersey City Galvanizing Company became the possession of W.H. Spowers, Sr., my grandfather. To him must go the credit for many innovations in galvanizing, among them the graduated firebox in coke settings, a principle still used in galvanizing settings.

"In the natural course of events, along came my father, the author of this book. His first job was working on a galvanizing kettle, stripped to the waist (this was W.J. Sr.'s. idea of learning a business, not his) and upon Sr.'s retirement, he continued to operate the company."

The early 1900s saw hand dipping give way to machine coating, and with it, greater uniformity. In 1911, aluminum was added to the zinc bath, greatly reducing cracking and flaking.

A few years later, World War I produced a special set of problems for the domestic zinc market, as it did in the iron, steel, copper, and lead industries. The result was a flurry of association-building to meet the demands both of war and of business.

It was in this context that the first meeting of the American Zinc Institute took place in St. Louis in July 1918. It was called by a group of men from Joplin, Miami, Oklahoma, and Kansas

after they had sent representatives to Washington to meet with a mining engineer named Pope Yeatman, who had dedicated his work to the government during the war.

W.R. Ingalls, the editor of the "Engineering and Mining Journal," summed up manufacturers' concerns. "Whereas former wars were matters of about 90% direct fighting and 10% engineering, the present war is about 20% fighting and 80% engineering." He also said, "In order that the engineers may do their work, the industries at home must supply them with material. We have learned that in order to maintain the supply of material, our industries are bound to organize themselves, for in no other way can they do what is necessary."

Ingalls was keenly aware of the implications of galvanizing's world-wide reach: "The zinc industry of this country is no longer going to be provincial," he said. "It is going to be national, and it is going to have serious international problems and complicated relations which are going to be uncomfortable to us unless we are prepared to face them properly."

One of the organization's early and continuing battles had to do with basic terminology. There was no agreement even about when the word galvanizing should apply, and that led to a number of testy exchanges and pronouncements.

For example, the American Zinc, Lead and Oil Journal of November 1921 published what it called Zinc's Ten Commandments. Of the first five, the last two illustrate the problem:

1. Be loyal to zinc; make of that metal what should be made of it.
2. Accept no substitutes for zinc.
3. If you want your roof to last a century, make it of zinc.
4. If you must have iron or steel in your building, to be exposed to the elements, zincize (galvanize) it.
5. Eliminate the word "galvanize" from your dictionary and substitute for it the word 'zincize'.

Several years later, in January 1927, the Bulletin of the American Zinc Institute commented on the use of "sheet steel," meaning galvanized or zinc-coated, on the part of the Sheet Steel Trade Extension Committee:

"It is far better to be given a nickname than to be denied any name," it said, adding: "There is as much logic in calling brass 'copper' as there is in applying the name 'sheet steel' to iron or steel" that has been zinc-coated. The bulletin went on to quote excerpts from a letter to the publication The Metal Industry from W.T. Flanders, who wrote the book "Galvainzing and Tinning."

"While it is true that the word zincing is a more appropriate term to apply to the different processes of coating with zinc than galvanizing," Flanders wrote, "nearly all the processes are generally known as galvanizing. Sherardizing passes as galvanizing as well as electro-galvanizing, and the process of coating with zinc by the Schoop process is often referred to as galvanizing. I have had occasion many times to explain that the process known as galvanizing was in reality zincing.

"There are now the following methods of applying zinc to other materials. 1. Hot dipping. 2. Electro-Zincing. 3. Vapor Zincing. 4. Spray Zincing.

"All of these come under the general classification of zincing. We have the art of tinning. Why not zincing?"

The sensitivity over terminology reflected a concern among galvanizers – expressed repeatedly throughout the industry's history – over competition from less expensive or more exotic alternatives, either anticipated or already on the market. The period between the World Wars was no exception. George H. Charls (sic), president of the National Association of Flat Rolled Steel Manufacturers, called the 1930s "a revolutionary age, with kaleidoscopic changes in public taste and demand."

Speaking to the 12th annual meeting of the American Zinc Institute in April 1930, he went so far as to suggest that a competing process could lure galvanizers from their own industry. "The future of zinc in galvanizing is of far greater concern to the miners and smelters than it is to the galvanizers, because the galvanizers are only serving a selfish interest, using the zinc as a protective coating because it helps to sell more iron and steel," he said. "Should a better or cheaper protective coating be introduced, there is nothing in the world to influence them to maintain their loyalty to zinc except a public demand which will make it necessary and profitable for them to do so."

In the 1920s and '30s, steel sheet was produced in long wide coils, stimulated by the burgeoning automobile industry, according to Porter. An American Engineer, Tadeusz Sendzimir, had the idea of continuously galvanizing the new flat product, and the first industrial installation was set up in France in 1936-1937.

Loyalty to zinc was sorely tested in the 1930s as long-time customers of galvanized sheets noticed a sharp decline in their quality. This came about because of abnormally high prices for zinc following World War I, leading manufacturers to try to save money by tightening the wringer through which galvanized sheets passed coming out of their zinc bath.

Karl Roth of the Braden Manufacturing Company in Terre Haute, Ind., issued this blunt assessment in 1933: "There is only one satisfactory roofing, particularly for farm use, and that is galvanized roofing," he said. "But its use the past few years has been greatly retarded due to rotten quality; I say 'rotten' as 'poor' does not describe it. This condition can and must be rectified to save the sheet metal roofing industry."

Even R.M. Roosevelt, who later became president of the American Zinc Institute, could not be sanguine. "I had used standard galvanized sheets on the roofs over Hegeler roasters for many years," he recalled a few years later. "A so-called standard sheet used in this location before the war lasted seven years. After the war was over, the same type of sheet used in the same place was in worse condition at the end of two years than it had been at the end of seven years before the war."

An investigation by the Zinc Institute found that the galvanized sheets produced before the war carried a zinc coating of approximately two ounces, that is, one ounce per square foot on each side of the sheet. After the war, many sheets were carrying very little more than half an ounce per square foot.

The institute then adopted the policy of licensing manufacturers to use what it called the Seal of Quality trademark on all sheets manufactured according to its specifications. The first steel producers to sign licenses were the Reeves Manufacturing Company and the Continental Steel Company, both on August 20, 1931.

The following April, at the 14th annual meeting of the American Zinc Institute, Roosevelt drew laughs by saying: "You know in thinking it over, every product that the farmer uses, practically everything from a gold coin to a sack of fertilizer, is guaranteed and has been guaranteed, except galvanized sheets and bootleg liquor."

A participant named Staebler was positively euphoric about the improved product: "I don't want to strut my ignorance before this group," he said, "but I believe I would rather have a piece of this two-ounce 'Seal of Quality' zinc sheet that I have seen in the other room today...than to have in my living room a Madonna painted by Raphael."

In 1933, Alvin O. Eckart, a farmer from Belleville, Ill., told the 15th annual meeting of the Zinc Institute what it needed to do to win back the confidence of farmers:

"Now fellows, if you want to sell corrugated roofs around by country today, you will have to give them a REAL sales talk," he said. "I believe the fellow you will have to go after now is the man who is making the roofing. There is no use to pass the buck to the dealer because he is going to sell what that fellow supplies him.

"Now, you are either going to get the business or not going to get it. You are going to give the farmer the kind of roof he wants, or he is going to get something else. This is a big world. Ford builds automobiles and thinks he is independent; the first thing you know somebody else comes along and gets his business. It is the same thing in every other line.... Fellows, unless you get this galvanized material and get it like this two-ounce coated stuff, agriculture is not interested."

The same year, undoubtedly spurred by Eckart's point of view, the American Hot-Dip Galvanizers Association was organized to promote wider use of hot-dipped galvanized products in the face of competition. "Even steel itself is threatened by aluminum's infiltration into many of its major markets," it noted.

Once again, in the 1940s, the industry was buffeted by war. As before, the availability of zinc for coatings diminished, and what was available went to the military effort. The largest single civilian market for galvanized products, that for sheet, was most affected, and many producers discontinued manufacturing for the duration.

"This situation is an ideal one for the development of substitutes, especially for civilian goods." N.E. Cook, general superintendent of galvanizing operations for the Wheeling Steel Corporation, wrote in the Journal of the American Zinc Institute in mid-decade. "We are confronted with many new developments and substitutes, backed up with advertising and 'fairy-tale' claims as to new and wonderful merits of new products; and, since we are all rather gullible, we might be inclined to accept most of these claims at their face value."

Competitive concerns worldwide led to the first International Conference on Hot-Dip Galvanizing in Copenhagen in 1950, held under the auspices of the Hot-Dip Galvanizers Association, founded in England the year before. Reports at the Conference described how galvanizing was being used around the world and stressed that to maintain growth, new applications would have to be found. It was noted that "surprisingly few" makers of agricultural equipment seem to have realized the effectiveness of galvanizing for protection against long exposure to all kinds of weather. Cited as a straw in the wind was the initial galvanizing of the

complete chassis of the British Land Rover, a feature that had been dropped for the time being to reduce the vehicle's cost.

It was agreed that few countries had studied the costs of maintaining the huge quantities of painted steel accessories used along railroad tracks. The Swiss, however, had changed from painted to galvanized supports for overhead power lines some 10 years before and concluded that, despite the higher initial cost, maintenance had been substantially reduced.

Most bus and truck chassis were painted with metal-pigmented paints, it was reported, but these would not prove so effective as galvanizing. "It may be hoped that the makers will decide to go the whole way before very long," the session concluded. "In the last year news has come from the U.S.A. of the galvanizing of motor car exhaust systems, a protective measure long overdue."

There was more good new from the United States. California law required all road bridges in the state to be fitted with galvanized steel railings.

As galvanizing approaches its 251st year, its practitioners can take heart from an endorsement received by the Witt Company in 1981. "Don't know if your Co. is still in existence," wrote Mrs. G. A. McKee of Pittsburgh, "but in going over some old papers, thought you would like to know that the garbage can we purchased in 1942 is still in existence and in excellent condition. About every five years gave it a coat of aluminum paint. It will probably last as long as I do." She included a tag that had come with the can and featured the Good Housekeeping Seal of Approval.